CLAIMS

1. A charged particle device (1) comprising:

a particle source (2) for providing a charged particle beam (4);

an objective lens (10) for focusing the particle beam onto a specimen (8), said objective lens (10) having an optical axis (6);

a particle mirror (14) located on the optical axis (6) of the objective lens (10), said particle mirror (14) having a front surface (27), a back surface (28), a drift region (26) reaching from the back surface (28) to the front surface (27) for letting the charged particle beam (4) pass from the back surface (28) to the front surface (27), said drift region (26) being positioned away from the optical axis (6), and a deflecting region (25) located on the front surface (27) for deflecting charged particles coming from the specimen (8) towards a detector (16).

2. The charged particle device (1) according to claim 1 wherein the particle mirror (14) comprises a deflecting region (25) located on the front surface (27) for deflecting all particles in a given velocity range and in a given angular range, so that the angle β_o between the outgoing path of the particle and the axes normal to the front surface of the mirror, at the point where the particle hits the mirror, equals the angle β_i between the incoming path of the particle and the axes normal to the front surface of the mirror.

3. The charged particle device (1) according to claim 1 or 2 wherein the drift region (26) reaching from the back surface (28) to the front surface (27) is positioned away from the geometrical center (40) of the mirror.

4. The charged particle device (1) according to one of the preceding claims further comprising a deflection unit (12C) for directing the charged particle beam essentially along the optical axis of the objective lens, said deflection unit (12C) being arranged between the particle mirror (14) and the objective lens (10).

5. The charged particle device (1) according to claim 4 comprising a three step deflection unit (12) for deflecting the charged particle beam (4) away form the optical axis (6) and essentially back onto the optical axis (6) of the objective lens (10).

6. The charged particle device (1) according to one of the preceding claim wherein the particle mirror (14) is tilted with regard to the optical axis (6) by an angel α between about 20 and about 70 degree, preferably between about 40 and about 50 degree, most preferably about 45 degree.

7. The charged particle device (1) according to one of the preceding claims wherein the particle mirror (14) comprises a conductive surface (21) or a conductive deflecting grid (41) kept on a predetermined potential sufficient to deflect all particles having less than a predetermined energy.

8. The charged particle device (1) according to claim 7 wherein the particle mirror (14) comprises at least one conductive screening grid (22) for screening potential of the conductive surface (21) or the conductive deflecting grid (41) from the rest of the device.

9. The charged particle device (1) according to claim 7 or 8 wherein the particle mirror (14) comprises a particle absorber (23) for absorbing particles having more than the predetermined energy.

10. The charged particle device (1) according to claim 7 or 8 wherein a second detector (24) is arranged behind the conductive deflecting grid (41) for detecting particles having more than the predetermined energy.

11. The charged particle device (1) according to one of the preceding claims wherein a high pass filter (30) is arranged in front of the detector (16), allowing only particles having an energy above a predetermined energy to enter the detector (16).

12. The charged particle device (1) according to claim 11 wherein the high pass filter (30) comprises a conductive filtering grid (31) kept on a predetermined potential sufficient to filter out all particles having less than a predetermined energy.

13. The charged particle device (1) according to one of the preceding claims wherein said drift region (26) is positioned away from the optical axis (6) of the objective lens (10), so that all charged particle coming from the specimen within an angle $\gamma \leq 5$ degree, preferably ≤ 10 degree, as measured from the optical axis (6) of the objective lens (10), hit the deflecting region (25) of the mirror (14).

14. A particle mirror (14) for use in a charged particle device comprising:

a front surface (27) and a back surface (28),

a deflecting region (25) located on the front surface (27) for deflecting all particles in a given velocity range and in a given angular range,

a drift region (26) reaching from the back surface (28) to the front surface (27) for letting particles pass from the back surface (28) to the front surface (27) of the mirror, the drift region (26) being positioned away from the geometrical center (40) of the mirror.

15. The particle mirror (14) according to claim 14 wherein the particle mirror (14) further comprises a conductive surface (21) or a conductive deflecting grid (41) kept on a predetermined potential sufficient to deflect all particles having less than a predetermined energy.

16. The particle mirror (14) according to claim 15 wherein the particle mirror (14) further comprises at least one conductive screening grid (22) for screening potential of the conductive surface (21) or the conductive deflecting grid (41).

17. The particle mirror (14) according to claim 15 or 16 wherein the particle mirror (14) further comprises a particle absorber (23) for absorbing particles having more than the predetermined energy.

18. The particle mirror (14) according to one of claims 14 to 17 wherein deflecting region (25) deflects the particles, so that the angle between the outgoing path of the particle and the axes normal to the front surface of the mirror, at the point where the particle hits the mirror, equals the angle between the incoming path of the particle and the axes normal to the front surface of the mirror,

19. A method for the examination of specimen with a beam of charged particles comprising the steps of:

providing a charged particle beam;

letting the charged particle beam pass through a drift region reaching from the back surface to the front surface of a particle mirror

focusing the particle beam onto a specimen with an objective lens, said objective lens having an optical axis; and

deflecting charged particles coming from the specimen towards a detector with a deflecting region of the particle mirror;

wherein said drift region is positioned away from the optical axis.

20. A charged particle (1) device comprising:

a particle source (2) for providing a charged particle beam (4);

an objective lens (10) for focusing the particle beam (4) onto a specimen (8);

a particle mirror (14) for deflecting charged particles coming from the specimen towards a detector (16); and

a high pass filter (30) being arranged in front of the detector (16), allowing only particles having an energy above a predetermined energy to enter the detector (16).

21. The charged particle device (1) according to claim 20 wherein the particle mirror (14) comprises a conductive surface (21) or the conductive deflecting grid (41) kept on a predetermined potential sufficient to deflect all particles having less than a predetermined energy.

22. The charged particle device (1) according to claim 21 wherein the particle mirror (14) comprises at least one conductive screening grid (22) for screening potential of the conductive surface (21) or the conductive deflecting grid (41) from the rest of the device.

23. The charged particle device (1) according to claim 21 or 22 wherein the particle mirror (14) comprises a particle absorber (23) for absorbing particles having more than the predetermined energy.

24. The charged particle device (1) according to one of claims 20 to 23 wherein the particle mirror (14) comprises a deflecting region (25) located on the front surface (27) for deflecting all particles in a given velocity range and in a given angular range, so that the angle β_o between the outgoing path of the particle and the axes normal to the front surface of the mirror, at the point where the particle hits the mirror, equals the angle β_i between the incoming path of the particle and the axes normal to the front surface of the mirror.

25. The charged particle device (1) according to one of claims 20 to 24 wherein the particle mirror (14) is tilted with regard to the optical axis (6) by an angel α between about 20 and about 70 degree, preferably between about 40 and about 50 degree, most preferably about 45 degree.